

What is claimed is:

1. An OFDM-CDMA-based transmission apparatus comprising:

first spreader for carrying out spreading processing on a plurality of transmission signals using mutually different spreading codes;

second spreader for carrying out spreading processing on at least one known signal using a spreading code different from the spreading codes; and

transmitter for subjecting the signals spread by said first spreader and said second spreader to frequency division multiplexing using a plurality of carriers and transmitting the multiplexed signal.

2. The OFDM-CDMA-based transmission apparatus according to claim 1, wherein said second spreader carries out spreading processing on a known signal whose signal level is higher than the levels of a plurality of transmission signals.

3. An OFDM-CDMA-based reception apparatus comprising:

receiver for receiving the signal on which a plurality of transmission signals and at least one known signal are spreading using mutually different spreading codes, and frequency-division multiplexed using a plurality of carriers;

first demodulator for extracting each reception

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signal by carrying out despreading processing on a received signal using a predetermined spreading code;

second demodulator for carrying out despreading processing on the received signal using a spreading code assigned to the known signal and thereby extracting a received known signal;

phase error detector for detecting a residual phase error using the known signal and the received known signal; and

phase compensater for carrying out phase compensation on the each reception signal using the residual phase error.

4. A communication terminal apparatus equipped with an OFDM-CDMA-based transmission apparatus and an OFDM-CDMA-based reception apparatus, said OFDM-CDMA-based transmission apparatus comprising:

first spreader for carrying out spreading processing on a plurality of transmission signals using mutually different spreading codes;

second spreader for carrying out spreading processing on at least one known signal using a spreading code different from the spreading codes; and

transmitter for subjecting the signals spread by said first spreader and said second spreader to frequency division multiplexing using a plurality of carriers and transmitting the multiplexed signal,

said OFDM-CDMA-based reception apparatus

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using:  
 receiver for receiving the  
 plurality of transmission signals;  
 and are spreading using mutual  
 and frequency-division m  
 plurality of carriers;  
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 by carrying out despread  
 ved signal using a predete  
 second demodulator for car  
 ssing on the received signa  
 ned to the known signal an  
 ved known signal;  
 phase error detector for de  
 using the known signal an  
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base station apparatus tha  
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first spreader for carrying out spreading processing on a plurality of transmission signals using mutually different spreading codes;

second spreader for carrying out spreading processing on at least one known signal using a spreading code different from the spreading codes; and

transmitter for subjecting the signals spread by  
5 said first spreader and said second spreader to frequency division multiplexing using a plurality of carriers and transmitting the multiplexed signal,

said OFDM-CDMA-based reception apparatus comprising:

10 receiver for receiving the signal on which a plurality of transmission signals and at least one known signal are spreading using mutually different spreading codes, and frequency-division multiplexed using a plurality of carriers;

15 first demodulator for extracting each reception signal by carrying out despreading processing on a received signal using a predetermined spreading code;

second demodulator for carrying out despreading processing on the received signal using a spreading code  
20 assigned to the known signal and thereby extracting a received known signal;

phase error detector for detecting a residual phase error using the known signal and the received known signal; and

25 phase compensater for carrying out phase compensation on the each reception signal using the residual phase error.

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6. A transmission method comprising:

first spreading step of carrying out spreading processing on a plurality of transmission signals using mutually different spreading codes;

5 second spreading step of carrying out spreading processing on at least one known signal using a spreading code different from the spreading codes; and

transmitting step of subjecting the signals spread by said first spreading step and said second spreading step to frequency division multiplexing using a  
10 plurality of carriers and transmitting the multiplexed signal.

7. A reception method comprising:

15 receiving step of receiving the signal on which a plurality of transmission signals and at least one known signal are spreading using mutually different spreading codes, and frequency-division multiplexed using a plurality of carriers;

20 first demodulating step of extracting each reception signal by carrying out despreading processing on a received signal using a predetermined spreading code;

second demodulating step of carrying out  
25 despreading processing on the received signal using a spreading code assigned to the known signal and thereby extracting a received known signal;

phase error detecting step of detecting a residual

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phase error using the known signal and the received known signal; and

phase compensating step of carrying out phase compensation on the each reception signal using the  
5 residual phase error.

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